



**PORTABLE DIESEL ENGINE  
INSTRUCTION MANUAL  
MAINTENANCE MANUAL  
SPARE PARTS LIST**



**water Cooled**  
**Diesel Engine Model**  
**PVL 35/45**  
**3.5 H.P. /1500 RPM**  
**4.5 H.P. /1800 RPM**  
**Model PVL 50/60**  
**5 H.P. /1500 RPM**  
**6 H.P. / 1800 RPM**



**Air Cooled**  
**Diesel Engine Model**  
**PAL 35/45**  
**3.5 H.P. /1500 RPM**  
**4.5 H.P. /1800 RPM**  
**Model PAL 50/60**  
**5 H.P. /1500 RPM**  
**6 H.P. / 1800 RPM**

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### PORTABLE DIESEL ENGINE

This book is designed to help the user to get the best results from the engine. No engine will run without care, but if it is given due attention described in the book, it will give good service.

All the instructions Incorporated In the manual can easly be carried out by the user.

Always deal immediately with any sings of defective running. Minor irregularitles always become worse and in the eng engine falls out of service.

#### **PLEASE REMEMBER :**

An engine needs clean fuel :

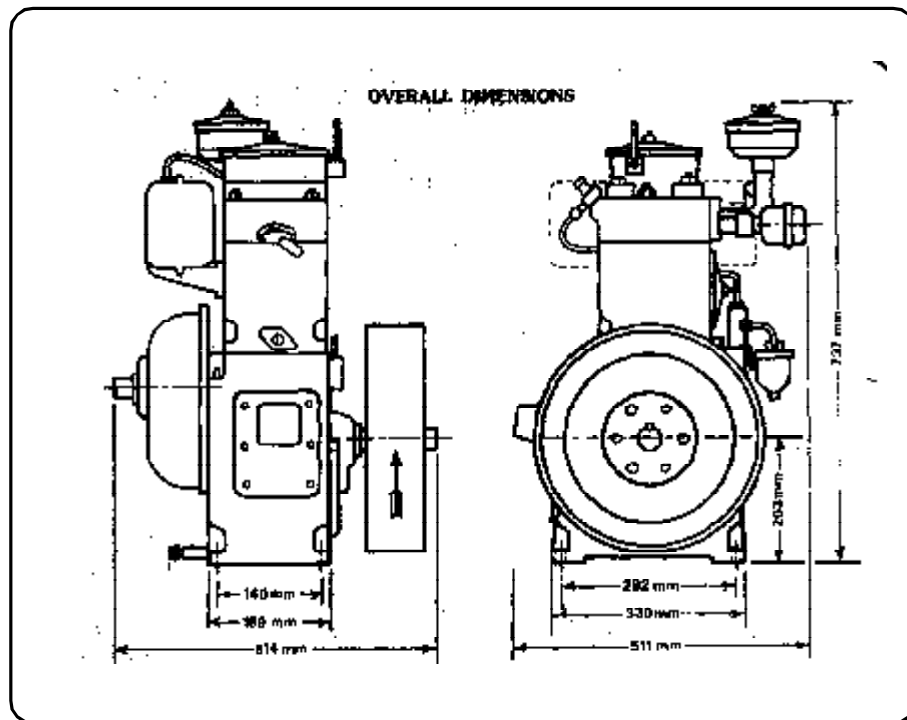
**KEEP FUEL TANK, FILTER AND PIPING CLEAN.**

An engine needs lubricating oil of correct grade.

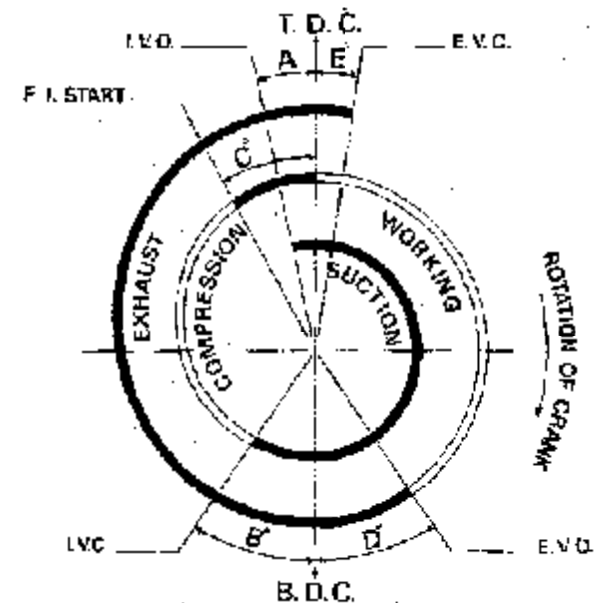
**KEEP OIL LEVEL IN SUMP TOPPED UP.**

An engine needs clean air.

**ENGINE. ROOM SHOULD BE AIRY, KEEP AIR CLEANER CLEAN. EXHAUST SILENCER AND AIR INTAKE SHOULD BE FREE OF ANY RESTRICTION.**



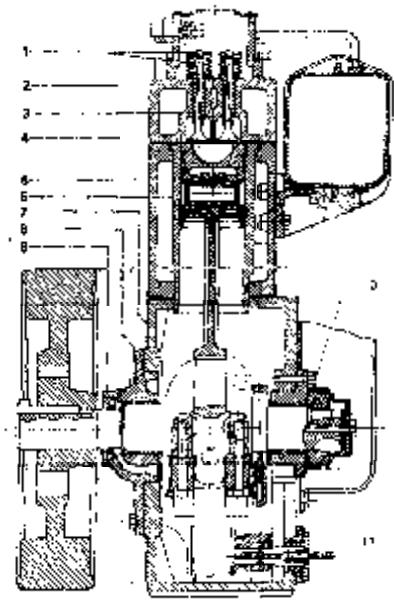
ANGLE FOR	APL-30	APL-45
A°	5°	5°
B°	35°	35°
C°	25°	30°
D°	35°	35°
E°	5°	5°



**VALVE TIMING DIAGRAM**

**Fig.-2 : SECTIONAL ELEVATION**

- 1 Valve seat, cup collar and collet.
- 2 Valve spring.
- 3 Valve guide.
- 4 Valve.
- 5 Gudgeon pin.
- 6 Gudgeon pin bush.
- 7 Crank shaft.
- 8 Housing.
- 9 Oil seal.
- 10 Thrust washer.
- 11 Lub. oil pump with strainer.



## TECHNICAL DATA

**DISEL ENGINE :-** ENGINE TYPE : VERTICAL, TOTALLY ENCLOSED,  
COMPRESSION IGNITION, FOUR STROKE CYCLE,

Sr.	ENGINE DETAIL	MODEL
01.	<b>RATED POWER</b>	<b>kW (HP)</b>
02.	<b>RATED SPEED</b>	<b>RPM</b>
03.	<b>MAX. TORQUE</b>	<b>Kgm</b>
04.	<b>NO. OF CYLINDER.</b>	-
05.	<b>CYLINDER POSITION</b>	-
06.	<b>BORE X STROKE</b>	<b>mm</b>
07.	<b>CUBIC CAPACITY</b>	<b>CC</b>
08.	<b>COMPRESSION RATIO</b>	-
09.	<b>FUEL OIL</b>	-
10.	<b>FUEL TANK CAPACITY</b>	<b>LITRES</b>
11.	<b>SPE. FUEL CONSUMPTION (AT RATED LOAD)</b>	<b>g / kWhr g / bhr-hr</b>
12.	<b>FUEL INJECTION EQUIPMENT</b>	<b>PUMP INJECTOR NOZZLE</b>
13.	<b>FUEL INJECTION PRESSURE</b>	<b>Kg/Cm2</b>
14.	<b>FUEL INJECTION TIMING</b>	<b>B.T.D.C. DEGREE</b>
15.	<b>LUBRICATING OIL</b>	-
16.	<b>LUB. OIL SUMP CAPACITY</b>	<b>LITRES</b>
17.	<b>LUB. OIL CONSUMPTION</b>	<b>LITRE/hr.</b>
18.	<b>COOLING WATER : TANK CAPACITY RUN THROUGH</b>	<b>LITRES LITRE/MIN.</b>
19.	<b>VALVE TAPET      INLET</b>	<b>mm</b>
	<b>CLEARANCE      EXHAUST</b>	<b>mm</b>
20.	<b>BUMPING CLEARANCE</b>	<b>mm</b>
21.	<b>FLYWHEEL DIA X FACE</b>	<b>mm</b>
22.	<b>CRANK AXIS HEIGHT</b>	<b>mm</b>
23.	<b>TYPE OF GOVERNOR</b>	-
24.	<b>CLASS OF GOVERNING</b>	-
25.	<b>MODE OF STARTING</b>	-
26.	<b>DIRECTION OF ROTATION</b>	-
27.	<b>TYPE OF AIR CLEANER : .....</b>	
28.	<b>TYPE OF FUEL FILTER : .....</b>	
29.	<b>WEIGHT OF ENGINE (BARE)</b>	<b>Kg (APPROX)</b>

## TECHNICAL DATA

DIRECT - INJECTION, TAPPER ROLLER BEARING TYPE, HIGH SPEED DIESEL ENGINE.

WATER COOLED ENGINE		AIR COOLED ENGINE
PVL - 35 / 45	PVL - 50 / 60	PAL - 40 / 50
2.6(3.5)/3.3(4.5)	3.7(5)/4.4(6)	2.9(4) / 3.7 (5)
1500 / 1800	1500 /1800	1500 /1800
1.7 /1.8	1.7 /1.8	1.7 /1.8
ONE	ONE	ONE
VERTICAL	VERTICAL	VERTICAL
80 X 80	85 x 80	85 X 80
402	0.454	454
17.2 : 1	17.2 : 1	17.2:1
HSD	HSD	HSD
4	6	6
246 / 181	246 (181)	250 184
MICO, PF 1A 80BS 587 / 11 MICO, 9 430 031 258 MICO, DLL 110S 1030		
190	190	190
25/25	25/25	25/25
SAE - 30/40	SAE - 30/40	SAE - 30/40
1.5	1.5	1.5
0.010 / 0.012	0.010/0.012	0.015/0.020
600	600	-
50	50	-
0.15	0.15	0.15
0.20	0.20	0.20
0.9 TO 1.2	0.9 TO 1.2	0.9 TO 1.2
292 X 70	292 X 80	292 X 85
150	150	150
MECHANICAL CENTRIFUGAL TYPE		
B1	B1	B1
HAND CRANKING BY STARTING HANDLE		
CLOCKWISE FACING FROM FLYWHEEL END		
OIL BATH TYPE FOR ALL MODELS.		
PAPER ELEMENT TYPE FOR ALL MODELS.		
85	90	90

### 3: INSTALLATION

**3.1 FOUNDATION :** The engine should always be installed on a good cement-concrete foundation. The composition for concrete is one part of cement, two parts of clean sharp sand and four to five parts of washed ballast. After pouring, the concrete should be allowed to set for at least 48 hours before engine is bolted down. In very hot and dry climate the block should be moistened with water during this period.

**(I) BELT DRIVEN UNIT :**

This details of the foundation block for fixed location are given in fig-3 for belt drive arrangement. The size of foundation bolt recommended is 1/2" BSW x 18" long. When plain belt drives are used the belt should be as close to the flywheel as possible. With fast and loose pulleys, the fast pulley must be nearer engine.

**(II) DIRECT COUPLED UNIT :**

For a direct coupled unit the size of the foundation block should be 40" long x 20" high. (1m x 0.5 m x 0.5m) The block should project 6" above the ground level. The size of the foundation bolt recommended is 1/2" BSW x 18" long. (M12x450mm)

**3.2 ERECTION :**

This engine should be levelled up on the foundation block. Where the engine is mounted on super structure, this should be of rigid construction and levelled before the engine is bolted down. In case of direct coupled set, the driven unit must be lined up with the engine and joined through a flexible coupling.

**3.3 PORTABLE INSTALLATIONS :**

In case of portable installation, it is necessary to consult our authorised engine distributors. An incorrectly installed engine may give endless trouble. In case of trolley mounted engine, the trolley should be parked on the horizontal ground. Inclination of the engine towards flywheel end results in the starvation of lub. oil pump and thereby failure of the bearings.

**3.4 EXHAUST SYSTEM :**

- [1] A standard engine fitted with a "pepper pot" type exhaust silencer, If the exhaust piping should be extended for instance to the outside of a building the exhaust silencer can be fitted on the end of an iron pipe screwed 1" BSP.
- [ii] Exhaust sytem should be as short as possible with a minimum number of bends. A faulty system can seriously reduce the power of an engine.
- [iii] When an installation has more than 4 metres (12 feet) of exhaust piping with two or three bends the diameter of the pipes must be increased to 1-1/2" BSP.

**4: COOLING SYSTEM**

**4.1 COOLING WATER TANK ARRANGEMENT :**

This arrangement is used in case of a permanent stationary installation, where the driven unit is not a pump used for pumping clear water, suitable for circulation through the engine. The arrangement along with details of foundation block is illustrated on page-4 Fig-3 for engines. Please note the following points :

- [1] The connection for water inlet should be made from the botton of tank to cylinder block. The inlet connection on cylinder block should be slightly below or in horizontal line with the outlet connection at the botto, of tank. The outlet connection on the tank should be above its bottom surface as shown in Fig-3 The inlet connection of cylinder head should be closed by using blank water flange.
- [iii] The water level in the tank should always be 3"(75mm) above the connection hole at the top. [iv] Do not cover the top of the tank.

**4.2 RADIATOR :**

The water inlet and outle connections on the engine should be similar to those mentioned above in cooling water tank arrangement. Please note the following points :

- [1] The radiator fan should draw air blast from the atmosphere and throw it over the engine (if in a reverse direction the engine will be overheated).
- [ii] The belt should be adequately tight, if slack move the fan assembly upwards and clamp it again, in case of a link-belt a suitable number of links should be removed to adjust the belt tension.
- [iii] The radiator should be topped up with water before starting the engine.

**4.3 RUN THROUGH SYSTEM :**

This system is used in case of a permanent (Stationary) & portable pumping set used for pumping clean water suitable for circulating through the engine.

Please note the following points :

- [1] The water inlet connections should be made from the delivery of the pump to cylinder head (on nozzle side). The should be closed by using blank water flange (Fig-4).
- [ii] Connect suitable length of pupes to the water outlet on cylinder-head for disposal of run through water
- [iii] The delivery pipe of the pump must rise sufficiently (approximately 6 if. vertically) above the pump. This ensures sufficient head for circulation of cooling water in the engine. The advantages of putting the water inlet connection at the cylinder head (insted of cylinder block) are as followsas :

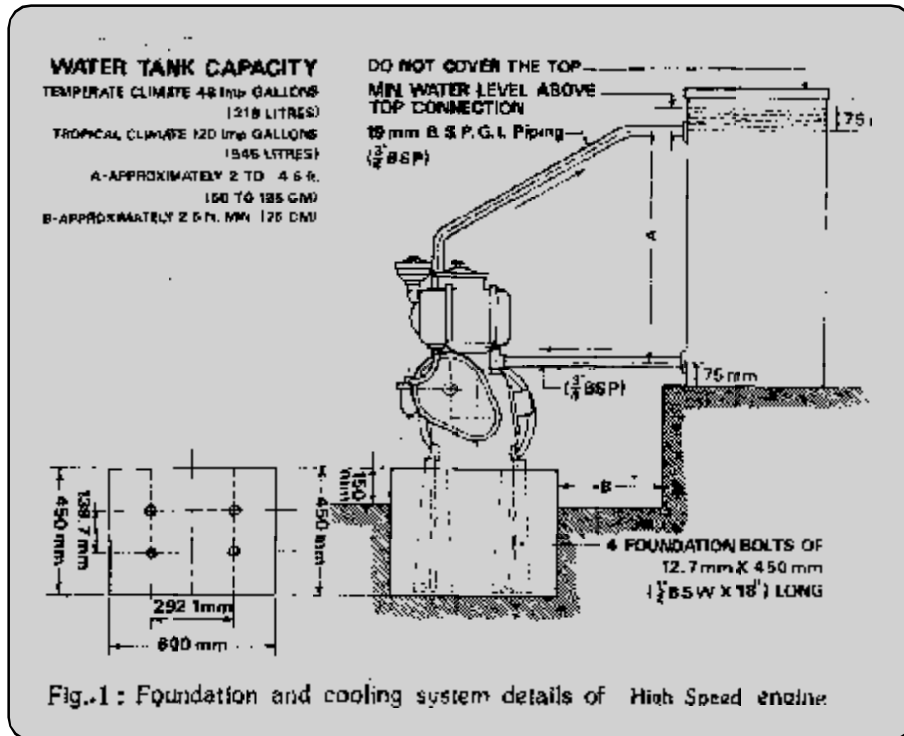


Fig.1 : Foundation and cooling system details of High Speed engine

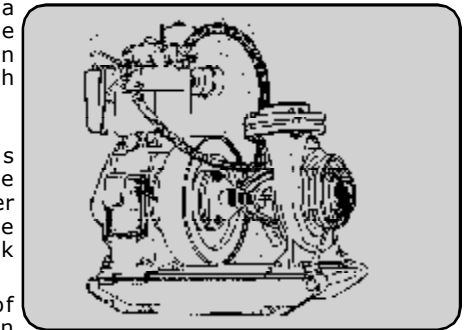


Fig.-4 Water inlet connections

- (A) Life and performance of the nozzle is improved.
- (B) Life of the valve is prolonged.
- (C) This system maintains the required temperature of the water jacket irrespective of the rate of flow, thus improving the thermal efficiency of the engine.
- (D) It keeps the air inlet passage in the cylinder head cool, thus eliminating possibility of loss of power by improving the volumetric efficiency of the engine. of the engine.
- (E) In case of failure of the water pump damage to the cylinder liner, piston and cylinder head will be delayed by the presence of water in the water jacket and cylinder head.

Fig.-5  
To fill lub. oil in the crankcase  
[1] Rocker box

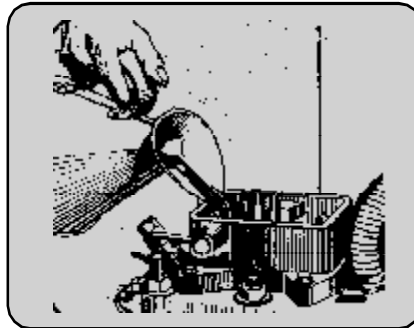


Fig.-6  
To check the oil level  
[1] Dipstick  
[2] Crankcase

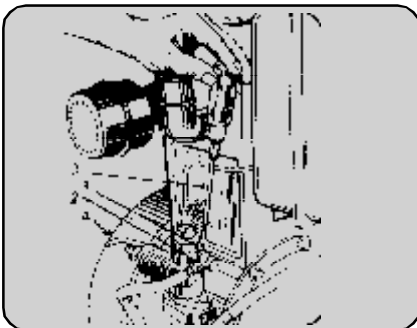


Fig.-7  
Removing air lock from  
The fuel pump  
[1] Vent screw [3]  
Screw driver  
[2] Fuel pump [4]  
Flywheel

**5: STARTING PROCEDURE :  
5.1 PRIOR TO START THE ENGINE :**

- [i] Fill the cooling water system with clean water. Make sure that all water connections are leak proof.
- [ii] Remove the rocker box cover by unscrewing the top nut. Pour lubricating oil upto the higher level mark on the dip-stick in unscrewed condition. Ensure that oil is not going through breather tube. Replace the cover. (Figs. 5 & 6).
- [iii] Lift the decompressor lever on the rocker box and crank the engine one or two dozen times. This helps circulation of the lub. oil to all bearing points before the engine is started up.
- [iv] Fill the fuel tank with clean fuel oil.
- [v] Bleed the fuel system as follows :
  - (A) Decompress the engine and turn the flywheel so that the TDC Mark is about 1/4th revolution away from the flywheel pointer.
  - (B) Loosen the vent screw on the fuel pump body near fuel delivering pipe. Allow fuel oil to bleed until it is free from air bubbles (Fig-7).
  - (C) To remove air bubbles in the system upto nozzle, crank the engine until a "squeak" is heard. This operation is "[priming".
- [vi] Remove the rocker box cover. Turn the flywheel slowly till both the (inlet & exhaust) valves are closed and the TDC mark coincides with the flywheel pointer. Check the valve clearance with the help of a feeler gauge. The clearance should be 0.15 mm for inlet valve and 0.20 mm for the exhaust valve. If not correct, it should be adjusted by manipulating the rocker adjusting screw. Please ensure that the lock-nut is

- [vii] Check and tighten, if necessary, the foundation bolts.
- [viii] The engine is now ready for a normal start.

**5.2 TO START THEENGINE :**

- [i] Lift the decompressor lever and engage the starting handle and turn the engine as fast as possible, When the flywheel is turning at a good speed push the decompressor lever down and continue cranking firmly for a few turns. The engine will fire now (Fig-9).
- [ii] If the first attempt fails, lift the decompressor lever and crank the engine slowly few times before attempting to start the engine.

**NOTE :**

The engine will emit black smoke on starting but after attaining full speed, the exhaust will be colourless or slightly bluish.

**WORKING TEMPERATURE :**

The lower portion of the engine (crank case) will get hot after it has worked for some time. Engine owner need not be worried about this. The engine should run hot for efficient performance. The heat will be so much as not to allow the operator to keep his palm on the crankcase.

**6: TO STOP THE ENGINE :**

- [i] Remove the load on the engine.
- [ii] Press the pump rack operating lever (external) towards the fuel pump and hold in that position until the engine stops (Fig-10.)

**IMPORTANT :**

The engine must never be stopped by using the decompressor lever. This will lead to damaged valve seats and cylinder head gasket.

**CAUTION :**

Wherever black smoke is observed, it may be due to choking of nozzle. At that time remove the nozzle holder and check nozzle spray. If nozzle is dribbling or choked clean it thoroughly and refit.

**7: RUNNING MAINTENANCE :**

**7.1 DAILY :**

- [i] Check the lubricating oil level in the sump. Top-up if necessary.
  - [ii] Keep the fuel tank full. The tank should oil at the end of the day's work.
  - [iii] Clean the engine at the end of the day's work.
- If there are any leakages, dust will collect at the leaky spots during next day's work. Such leakages should be attended to promptly.

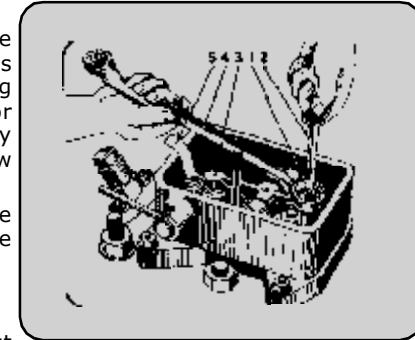


Fig.-8 To check the valve clearance  
[1] Adj. screw  
[2] Screw driver [3] Valve rocker  
[4] Ring spanner [5] Feeler gauge

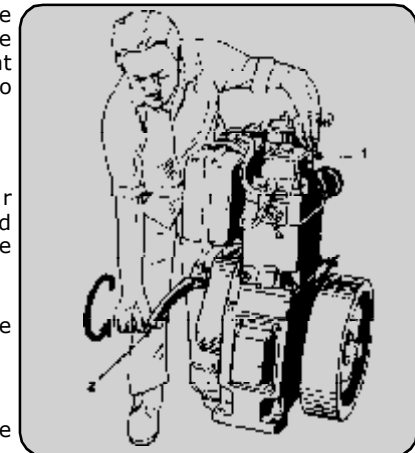


Fig.-9  
To start the engine  
[1] Decompressor lever  
[2] Starting handle

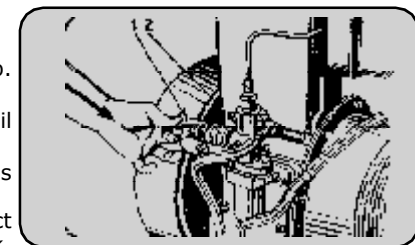


Fig.-10  
To stop the engine  
[1] Rack operating lever  
(external)  
[2] Fuel pump

- [iv] In case of tank or radiator cooled engines, check the water level and top-up, if necessary, before starting the engine.

**7.2 EVERY 50 HOURS (WEEKLY) :**

Clean the air cleaner completely.

**7.3 (i) MONTHLY :**

- (A) Tighten all bolts, nuts and keys.
- (B) Make sure that the vent hole in the fuel tank cap is clear.
- (C) Knock out soot from the exhaust silencer.
- (D) Clean the fuel filter.

**(ii) EVERY 250 HOURS :**

- (A) Drain the sump. Flush-out with approved brand of flushing oil and refill new oil.
- (B) Check the fuel system for leakage.

**7.4 EVERY 500 HOURS :**

- [i] Remove the injector and test spray.
- [ii] Remove cylinder head, decarbonise piston top and inside of inlet & exhaust ports.
- [iii] Examine and grind in if necessary,, the inlet exhaust valves.
- [iv] Withdraw the piston and carefully clean out oil return holes.
- [v] Clean the 'Button' filter in the fuel pump delivery pipe union at the injector end.

- [vi] Change the filter element in fuel oil filter & Paper Air Filter (If provided)
- [vii] Check valve clearances. adjust if necessary.

**7.5 EVERY 1000 HOURS :**

- [i] Examine large end bearing and replace, if clearance is excessive.
- [ii] Wash out lub, oil pipes.
- [iii] Clean out water spaces in cylinder head and radiator. The use of descaling compound is strongly recommended.

**8 : WORKINGCYCLE :**

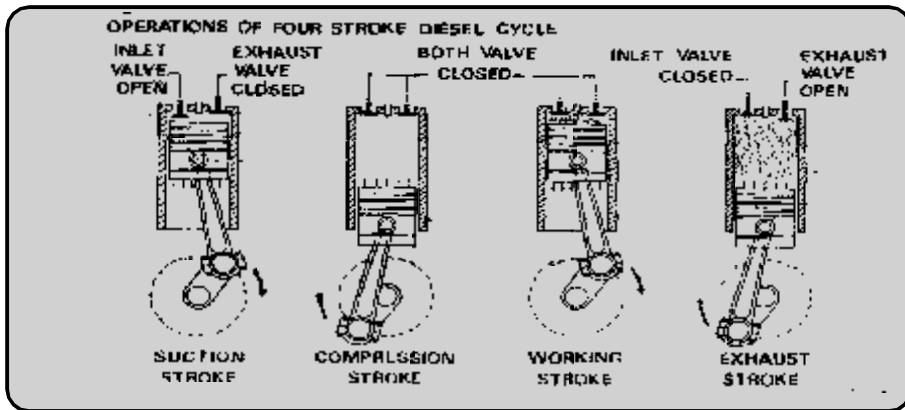


Fig.-11 : Working cycle

**[i] SUCTION STROKE :**

During the downward motion of the piston, the air inlet valve opens and fresh air from the atmosphere is sucked into the cylinder.

**[ii] COMPRESSION STROKE :**

Both the valves are closed, the piston moves up compressing the air and thereby heating. Just before top dead centre a very small quantity of fuel is injected under high pressure in the form of spray.

**[iii] POWER STROKE (WORKING STROKE) :**

The injected fuel mixes with hot air that is compressed and is ignited

at the high temperature and pressure, this combustion occurring inside the combustion chamber causes further rise in temperature and the piston is forced down.

**[iv] EXHAUST STROKE :**

The exhaust valve is kept open, on moving up again the piston pushes the burnt gases out.

These four strokes complete a cycle of operation.

**9: MAINTENANCE PROCEDURE :**

**9.1 FUEL SYSTEM :**

- [i] Type of fuel : Use clean high speed diesel oil. Insist on purchasing the fuel from authorised dealers of the oil companies.
- [ii] Fuel oil system includes the following fittings for ensuring cleanliness and consequent dependable service of fuel injection equipment for a long period.
  - (A) Fuel oil strainer under the fuel tank cap.
  - (B) Ceramic filter at the fuel tank and fuel pump.

**MAINTENANCE :**

- [i] The fuel tank should be full at the end of the day's work. This prevents condensation of moisture from the air in the empty tank due to cold of the night. While filling make sure that the fuel oil strainer is in position.
- [ii] Clean thoroughly the fuel oil tank after every 250 hours (monthly), Clogging of filter is unavoidable, frequency depends upon the cleanliness of the fuel fed to the engine.

**9.11 FUEL FILTER :**

The filter is fitted with a paper element. This element cannot be cleaned, but it has to be replaced after 500 hours or earlier if required.

**9.2 AIR SUPPLY SYSTEM :**

**9.2.1 PAPER ELEMENT TYPE AIR CLEANER.**

- [i] See that the clip of the air cleaner is tightly clamped on the manifold, manifold. Remove the paper element by loosening the nut. Knock out the dust from the element by just tapping it gently on a wooden piece. This should be done every week. Change the paper element when choked or after every 500 hours whichever is earlier.

**9.2.2 OIL BATH AIR CLEANER :**

- [i] An oil washed air cleaner efficiently operates when filled with clean lub. oil.
- [ii] To fill the cleaner remove the element after unscrewing the top nut.
- [iii] To clean the cleaner loosen the clip which holds it on inlet elbow. Pull the cleaner off the inlet elbow. Remove the element, empty out the old oil and clean out the sediment. refill with clean oil upto the hole [3] indicated in Fig-12.

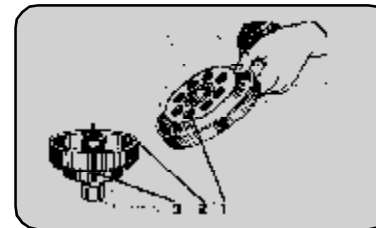


Fig.-12 Oil bath air cleaner

- [1] Wire mesh
- [2] Oil container [3] Oil hole

**9.2.3 TO TEST FUEL INJECTOR :**

- [i] Disconnect the pipe connection from fuel injector to the fuel pump, and leak off. Remove the two nuts on the injector flange and carefully lever out the injector assembly.
- [ii] Connect the high pressure pipe to the fuel injector again in such a way that the nozzle points away from the engine.
- [iii] Crank the engine, Fuel oil should squirt out suddenly in a fine mist

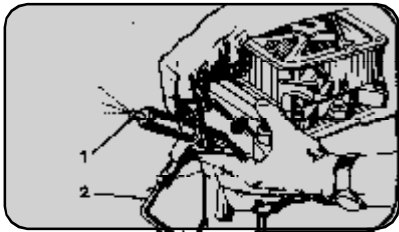


Fig.-13 To test fuel injector  
[1] Injector [2] H. P. Pipe

spray, or if it gives solid squirts of fuel, or if it dribbles after the sprays have stopped, it should be replaced (Fig-13).

**CAUTION :**

Be careful that the injector spray is not directed to an exposed part of the body. The force behind the spray will cause it to penetrate skin.

**9.2.4 TO FIT FUEL INJECTOR :**

- [i] Push the injector assembly into position by hand. Do not use force.
- [ii] Be sure there is copper washer on the nozzle. One removal it may have remained inside the cylinder head. Only one washer should be used.

- [iii] Tighten evenly two nuts on the injector flange. The injector should not bind on one edge.

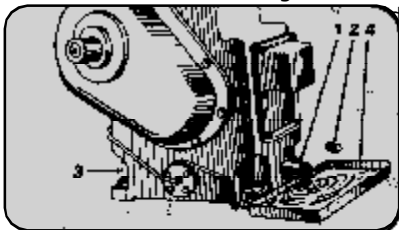


Fig.-14 To drain the sump  
[1] Drain pipe  
[2] Drain plug  
[3] Crankcase  
[4] Oil container

'Bleed' the fuel system.

**9.3 LUBRICATING OIL SYSTEM :**

**9.3.1 TYPE OF LUB. OIL :**

The performance and durability will be fully guaranteed by using oil that is suitable for 'High Speed' diesel engines. The grade of oil to be used for engine temperature conditions (please refer to the chart No.-1 on page No.-14).

**9.3.2 CHANGE OF LUBRICATING OIL :**

- [i] The lubricating oil strainer is fitted over the suction boss of the pump body. After removing the by -

filter assembly, the strainer can be reached by hand. Slacken the worm clip and pull it off towards the flywheel. It should be washed in clean fuel oil and replaced.

**NOTE :**

- (A) Lubricating oil should be changed after every 250 hours of running.
- (B) Always drain the sump only when the engine is hot.

**9.4 FLUSHING THE ENGINE :**

In order to prevent formation of sludge inside the engine, it should be flushed out at the time of putting new change of lubricating oil. This operation will thoroughly clean the engine sump, oil pipe connection and passages. Use flushing oil marketed by various suppliers as listed in chart No. 1.

**9.4.1 TO FLUSH THE ENGINE :**

- [i] Drain the sump as given above and replace the drain plug.
- [ii] Pour flushing oil through the rocker box until the oil level reaches the top mark on the dipstick. It is important that oil containers, funnels etc. should be kept spotlessly clean.
- [iii] Replace the rocker cover. Run the engine on a very light load for about ten minutes. Use only approved grades of flushing oil listed in chart 1.
- [iv] Drain flushing oil in the crankcase. Clean the lubricating oil strainer, sump and oil pockets.

**NOTE :**

Drained flushing oil should be stored in a clean container with dust proof lid. Same oil can be used again for flushing at the next change of lub. oil.

**9.4.2 CHANGE OF NEW LUBRICATING OIL :**

- [i] Pour the correct grade of lub. oil through the rocker box, until the oil level reaches the top mark on the dipstick (in unscrewed condition). It is important that oil containers, funnels etc. should be kept spotlessly clean and dry.
- [ii] Replace the rocker box cover in position. The engine is now ready for operation with new lub. oil.

**NOTE :**

Cheap unsuitable or dirty oil will cause trouble and immeasurable harm to the engine. The engine owner is requested to insist on the approved grade of oil in a sealed container from an authorised supplier only.

**9.5 COOLING SYSTEM MAINTENANCE :**

- [i] Always maintain level of water 3" above the top connection in case of Tank-Cooling. If radiator is fitted, it should be topped up before starting the engine. In case of run through water cooling, it should be seen that water flows out from the outlet pipe as soon as the engine starts.
- [ii] Drain the system once a month or earlier if necessary; clean the inside of tank and jacket. For cleaning the water passage of the engine, run the engine on no load till the temperature of water reaches maximum. While the engine is still idling open the drain cock or blanking plate on the cylinder block and allow water to flow out. This will drain away any impurities which may be embedded in the water passage of the engine. As the water is draining out, keep on adding fresh water through the inlet with the engine still idling. Continue this for at least five minutes.
- [ii] Hard water is not suitable for circulation through the engine as salts in it get deposited and clog the engine. Hence water jackets should be cleaned every week; use descaling compound available in the market. Alternatively prepare the following mixture and pour it in the cooling system. Water 20 litres, kerosene 2.5 litres and washing soda 0.5 Kg. Run the engine till it becomes hot. Drain the descaling mixture, wash the cooling system with clean water twice or thrice. The cleaning should be done every 500 hours. In case water available contains large percentage of salts, this should be done every 250 hours

**10: ENGINE SPEED ADJUSTMENT :**

- [i] Fixed speed governor : The engine speed may be adjusted by turning the rack adjusting nut near the speeder spring on the rack extension rod. By tightening this nut, the speed will increase. After adjusting, the speed adjustment should be securely locked by the lock nut. This adjustment allows a variation of approximately 150 RPM up and down.
- [ii] External governor linkage : Under no circumstances should the governor lever adjusting screw at the end of F.P.Rack operating lever (External) be tampered with. The Adjustment is set at the works and sealed. Any further adjustment may result in the engine "running away" when the load is removed. This can cause the failure of engine.

**11 : WORNOUT PARTS**

**11.1 CYLINDER LINER :**

Whenever cylinder liner bore size becomes over size by nearly 0.3 mm, replace the liner. It is not advisable to rebore the liner and fit oversize piston and rings.

**11.2 UNDESIZ BEARINGS :**

- [i] Undersize large end bearing shell from 0.254mm (0.010")\_ to 1.016mm (0.040") below standard diameter are available. Corresponding crankshaft journal and bearing sizes are given in paragraph-11.3

**11.3 Undersize crankshaft:**

Crank pin journals should be reground to the following size when scratches are found on the bearing portion.

Diameter of crankpin journal for Nominal size / Standard Size Normal Under Size	Under size crank shaft	
	35/45	50/60
-0.25 mm (0.010")	49.75	53.75
-0.50 mm (0.020")	49.50	53.50
-0.75 mm (0.030")	49.25	53.25
-100 mm (0.040")	49.00	53.00

**12. Storing the Engine:**

If the engine is going to remain out of use for considerable period, following points should be attended to before storing the engine.

- [1] Run engine until it is warm.
- [2] Drain the fuel oil from the tank, filter and fuel pipes. Fill in a suitable preservative and turn the engine to remove fuel from high pressure fuel lines and injectors.
- [3] Drain and flush the lub. oil system and fill in suitable preservative of the same SAE number. Clean the filter.
- [4] Drain all the water from cylinder head and cylinder block by removing the blank water flange on the cylinder block.
- [5] Clean the exhaust silencer and spray preservative into this.
- [6] Remove the injection nozzle and spray 1/4 litre of preservative oil in the cylinder bores. Replace the nozzle.
- [7] Cover the engine externally thoroughly.
- [8] Cover it so as to protect it from rain and dust.

**Recommended Preservative**

Recommended Preservative for

Supplier's Name	Fuel System	Lubricating System
Burmah Shell	Shell Fuses oil or Boc Calibrating oil	Shell Ensis of corresponding SAE No.

Caltex (India) Ltd.	Caltex Preservative Engine Oil
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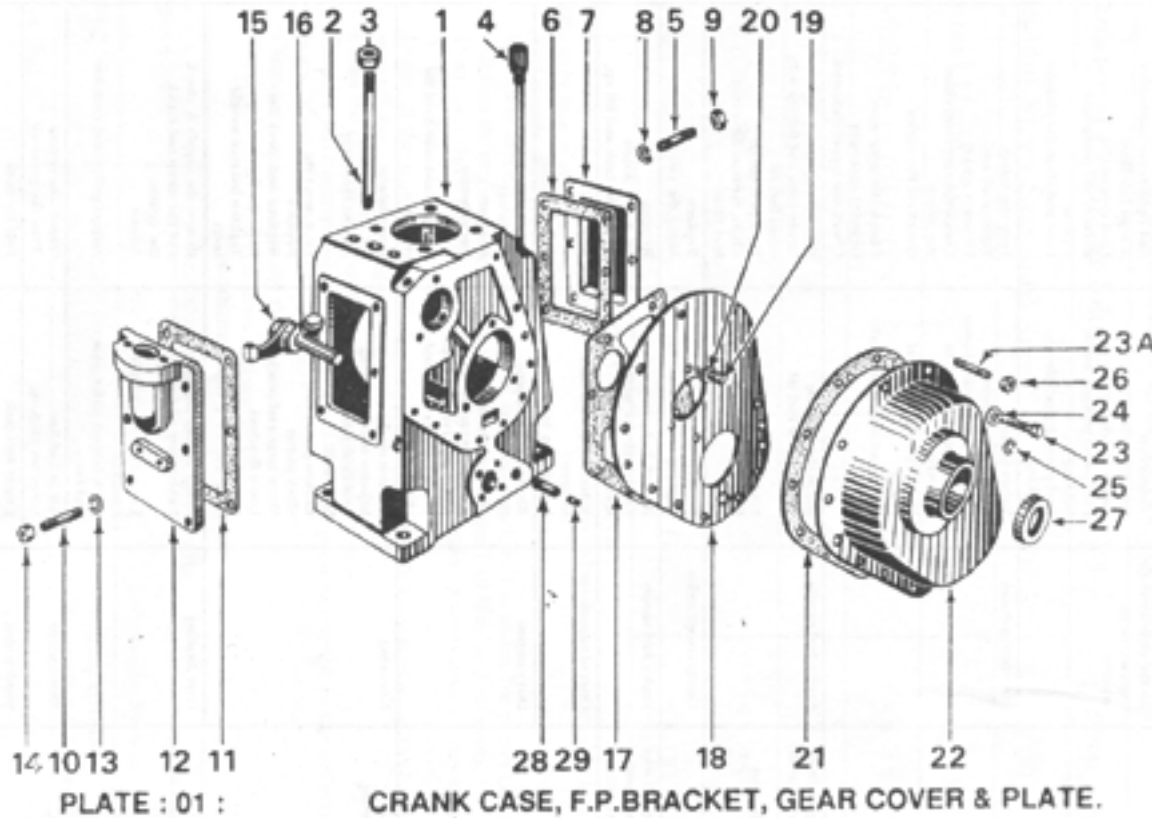
The Recommended rustproof products for external surface are as below.  
Burmah Shell Shall ensis fluid 260

Caltex (India) Ltd. Caltex Rustproof Compound. BOC RDF 260

TROUBLE LOCATING CHART FOR HIGH SPEED DIESEL ENGINES (FOR INFORMATION ONLY)			
Trouble	Reason	Causes	Suggested remedy
Engine will not start on cranking	Fuel supply failure Check by cranking the engine and listen for the characteristic "squeak" in the injector	No fuel in the tank Air in the fuel line Broken fuel pipe or leaking connection Fuel filter choked Faulty injector nozzle Fuel pump plunger nozzle sticking Fuel pump tappet plunger sticking	Fill the tank "Bleed" the system Repair or replace the pipe and tighten the connection Clean fuel filter Fit a new nozzle Remove the pump and replace Free and clean the plunger
	Poor compression	Valves sticking Cylinder head loose Cylinder head gasket blown Piston rings stuck in the Grooves Worn cylinder liner and piston Valves not seating properly	Free the valves Tighten all nuts Fit a new gasket Check the rings and clean the piston Overhaul the engine  Check the valve seats Grind if necessary Check the tappet clearance

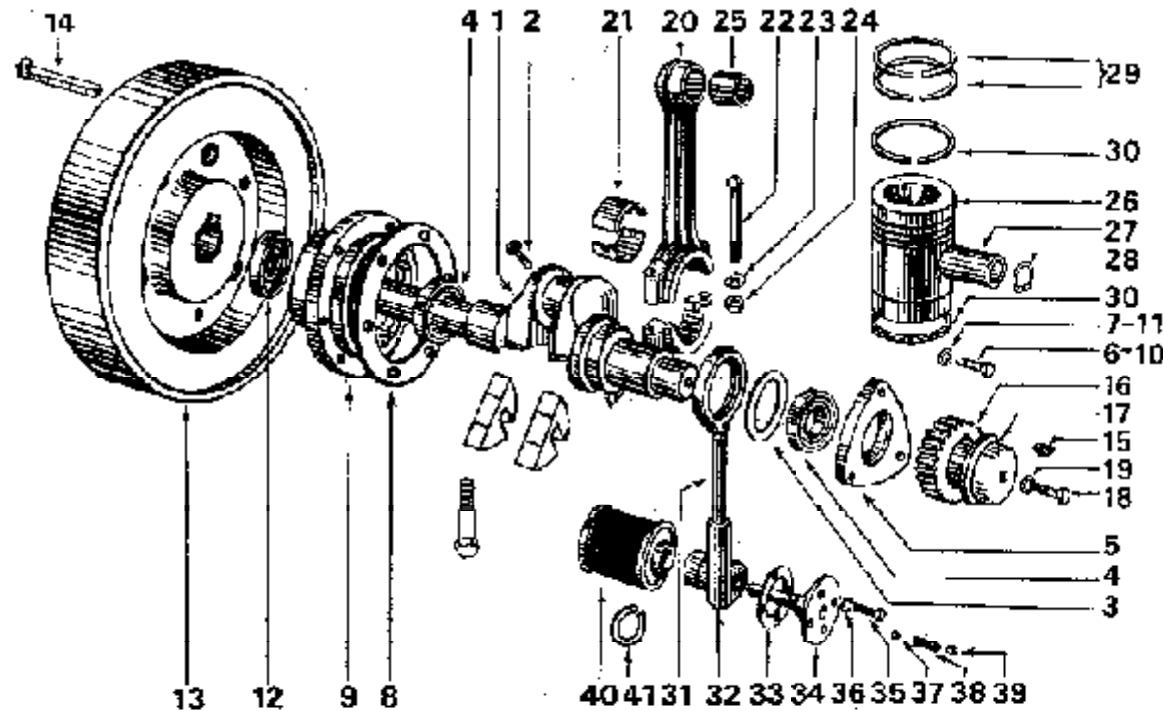
Engine fires intermittently of stops soon	Faulty fuel supply	Air in the fuel line Water in the fuel oil  Faulty injector nozzle Fuel filter choked	Bleed the system Drain tank and fill up with clean fuel oil Fit a new nozzle Clean ceramic filter and fuel filter
	Faulty compression	Broken valve spring Sticking valve	Replace Free the valve
Engine lacks power with dirty exhaust	Faulty fuel supply	Broken fuel pump spring Faulty injector nozzle Unsuitable fuel oil	Replace Fit a new nozzle Drain the tank and fill up
	Out of adjustment	Valve tappet clearance incorrect Fuel timing incorrect	Adjust Adjust timing
Faulty running	Dirty engine	Blocked exhaust pipe Dirty air filter Faulty piston ring Excessive carbon on piston and cylinder head Worn cylinder liner and piston	Clean out Clean out Replace Decarbonize  Replace and over-haul the engine
	Knocking	Carbon on the piston crown Injector needle sticking Fuel timing too far advanced Broken piston ring Slack piston Worn large end bearing Loose flywheel Loose balance weight	Decarbonize Fit a new nozzle Adjust the timing  Fit a new ring Replace Replace and check the Refit the flywheel key Tighten balance weight bolts
Speed surge	Over heating	Water supply failure Lubricating oil failure  Excessive valve tappet clearance Slack belt on water pump and fan	Renew the supply & check Fill the sump and check the system Adjust  Adjust pulley and radiator
	Sudden stop	Air in fuel line Governor sticking	'Bleed' the system Free the governor
Heavy vibration	Sudden stop	Empty fuel tank Choked injector Fuel pipe broken Seized piston	Full the tank Fit a new nozzle Replace or repair Fit a new piston or in an emergency, scrape it with honning stick
	Heavy vibration	Loose holding down bolts	Tighten up

## CRANK CASE, F. P. BRACKET, GEAR COVER & PLATE.



Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	CRANK CASE	1	1	1	1
02.	STUD For Cy.& Cy. Head (Short)	3	3	3	3
-	STUD For Cy.& Cy. Head (Short)	1	1	1	1
03.	NUT for 2.	4	4	4	4
04.	Oil level DIP STICK	1	1	1	1
05.	STUD for Crank Case Door/Cover	6	6	6	6
06.	JOINT Crank Case Door/Cover	1	1	1	1
07.	Crank Case DOOR/COVER	1	1	1	1
08.	Spring Washer	6	6	6	6
09.	nut for 5	6	6	6	6
10.	STUD for F.P. Bracket	6	6	6	6
11.	JOINT for F.P. Bracket	1	1	1	1
12.	FUEL PUMP BRACKET	1	1	1	1
13.	Spring Washer	6	6	6	6
14.	NUT for 10	6	6	6	6
15.	Fuel Pump ROCKER LEVER	1	1	1	1
16.	SPINDLE for Rocket Lever	1	1	1	1
17.	JOINT for Gear Cover Plate	1	1	1	1
18.	GEAR COVER PLATE	1	1	1	1
19.	SET BOLT for G.C.Plate	2	2	2	2
20.	Spring Washer	2	2	2	2
21.	JOINT for Gear Cover	1	1	1	1
22.	GEAR COVER	1	1	1	1
23.	BOLT for G. Cover & Plate	4/10	4/10	4/10	4/10
23/A	STUD for G. Cover (Alternate)	6	6	6	6
24.	Spring Washer	10	10	10	10
25.	Spring Washer	10	10	10	10
26.	NUT for 23	4/10	4/10	4/10	4/10
27.	OIL SEAL for Cam Shaft	1	1	1	1
28.	DRAIN PIPE	1	1	1	1
-	JOINT (Washer) for 29	1	1	1	1
29.	DDRAIN PLUG	1	1	1	1

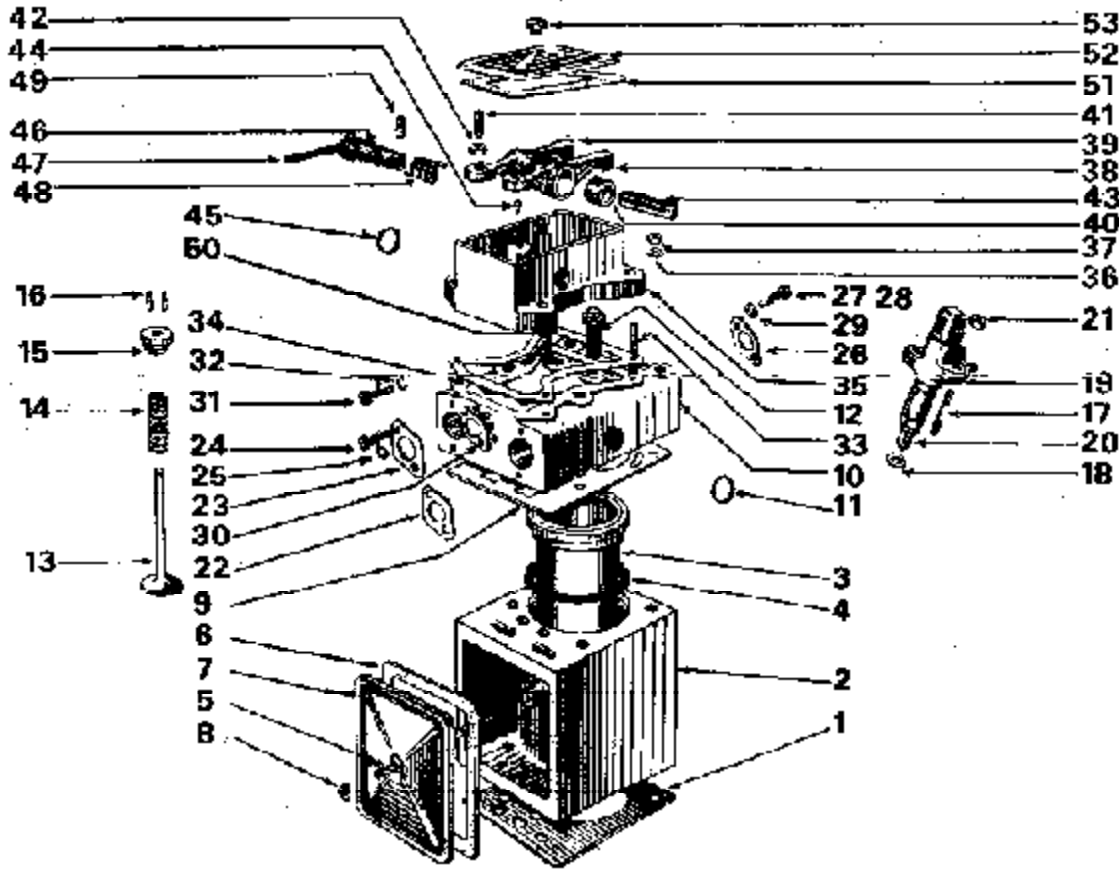
## CRANK SHAFT, CONNECTING ROD, PISTON, FLYWHEEL AND LUB. OIL PUMP



**PLATE : 02 : CRANK SHAFT, CONNECTING ROD, PISTON, FLYWHEEL AND LUB. OIL PUMP**

Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	CRANK SHAFT	1	1	1	1
02.	Oil Hole Plug (Bolt)	1	1	1	1
03.	Bearing SPACER	1	1	1	1
04.	Main/Journal BEARING (TRB)	2	2	2	2
05.	M. B. HOUSING (Gear End)	1	1	1	1
06.	STUD for M. B. Housing (G.E.)	3	3	3	3
-	BOLT for M. B. Housing (Altemate)	3	3	3	3
07.	Spring Washer	3	3	3	3
-	NUT for 6	3	3	3	3
08.	JOINT for M. B. Housing (F.E.)	1/3	1/3	1/3	1/3
09.	M. B. Housing (Flywheel End)	1	1	1	1
10.	STUD for M. B. Housing (F.E.)	6	6	6	6
-	BOLT for M. B. Housing (Altemate)	6	6	6	6
11.	Spring Washer	6	6	6	6
-	NUT for 10	6	6	6	6
12.	OIL SEAL for Crank Shaft	1	1	1	1
13.	FLY WHEEL	1	1	1	1
14.	Fly Wheel KEY	1	1	1	1
15.	Woodruff KEY for Crank Gear	1	1	1	1
16.	Crank Shaft GEAR	1	1	1	1
17.	Retaining CUP	1	1	1	1
18.	BOLT for Retaining Cup	1	1	1	1
19.	Spring Washer	1	1	1	1
20.	CONNECTING ROD with Cap	1	1	1	1
21.	BIG END BEARING (Pair)	1	1	1	1
22.	BIG END BOLT	2	2	2	2
23.	TAB Washer fot B. E. Bolt	2	2	2	2
24.	C. R. NUT for 22	2	2	2	2
25.	SMALL END BUSH	1	1	1	1
26.	PISTON	1	1	1	1
27.	GUDGEON PIN	1	1	1	1
28.	CIRCLIP	2	2	2	2
29.	Piston's Compression RINGS	2	2	2	2
30.	Piston's OIL Control Rings	2	2	2	2
-	LUB OIL PUMP Complete	1	1	1	1
31.	LUB OIL Pump PLUNGER with Eccentric Strap	1	1	1	1
32.	Lub. Oil Pump BODY	1	1	1	1
33.	JOINT for Fulcrum pin	1	1	1	1
34.	FULCRUM PIN	1	1	1	1
35.	BOLT for Fulcrum pin	3	3	3	3
36.	Spring Washer	3	3	3	3
37.	MALL VALVE (for Plunger & Fulcrum Pin)	2	2	2	2
38.	SPRING for Ball Valve	1	1	1	1
39.	WASHER for B. V. Spring	1	1	1	1
40.	LUB OIL SREAINER	1	1	1	1
41.	CLIP for Strainer	1	1	1	1

## CYLINDER BLOCK, LINER, HEAD AND ROCKER BOX.



Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	Joint (SHIMS) for Cy. Block	As Requirement			
02.	CYLINDER BLOCK	1	1	1	1
03.	CYLINDER LINER	1	1	1	1
04.	LINER RUBBER RING	1	1	1	1
05.	STUD for Push Rod Cover	1	1	1	1
06.	JOINT for Push Rod Cover	1	1	1	1
07.	PUSH ROD COVER	1	1	1	1
08.	NUT for 5	1	1	1	1
09.	Cy. Head GASKET	1	1	1	1
10.	CYLINDER HEAD	1	1	1	1
11.	Core Plug for Cy. Head	2	2	2	2
12.	VALVE GUDIE	2	2	2	2
13.	Inlet & Exhaust VALVE	2	2	2	2
14.	VALVE SPRING	2	2	2	2
15.	Valve Spring CUP/COLLER	2	2	2	2
16.	VALVE collet COLLET (Pair)	2	2	2	2
17.	STUD for Nozzle Holder	2	2	2	2
18.	JOINT (Washer)for Nozzle Holder	1	1	1	1
19.	NOZZLE HOLDER (Atomiser/Injector)	1	1	1	1
20.	NOZZLE	1	1	1	1
21.	NUT for 17	2	2	2	2
22.	JOINT for Air Inlet Bend	1	1	1	1
23.	GASKET/JOINT for EXhaust Flange	1	1	1	1
24.	STUD for Air & Exhaust Flange	4	4	4	4
25.	Spring Washer	4	4	4	4
-	NUT for 24	4	4	4	4
26.	JOINT for Water Inlet & Blanking Plate	2	2	2	2
27.	STUD for Water Inlet Flange	2	2	2	2
28.	BOLT for Water Blanking Plate	2	2	2	2
29.	Spring Washer	4	4	4	4
-	NUT for 27	2	2	2	2
30.	JOINT for Washer Outer Outlet Flange	1	1	1	1
31.	STUD for Washer Outlet Flange	2	2	2	2
32.	Spring Washer	2	2	2	2
-	NUT for 31	2	2	2	2
33.	STUD for Rocker Box	4	4	4	4
34.	JOINT for Rocker Box	1	1	1	1
35.	ROCKER BOX	1	1	1	1
36.	Spring Washer	4	4	4	4
37.	NUT for 33	4	4	4	4
38.	Valve Rocker ARM (Air Intake)	1	1	1	1
39.	Valve Rocker ARM (Exhaust)	1	1	1	1
40.	Valve Rocker Bush	2	2	2	2
41.	Rocker ADJUSTING SCREW	2	2	2	2
42.	LOCK NUT for 41	2	2	2	2
-	Rocker SPRING	1	1	1	1
43.	ROCKER SHAFT	1	1	1	1
44.	GRUB SCREW for Rocker shaft	1	1	1	1
-	LOCK NUT for 44	1	1	1	1
45.	CORE PLUG for Rocker Box	2	2	2	2
46.	DECOMPRESSOR SHAET	1	1	1	1
47.	De. Comp. Opererating LEVER	1	1	1	1
48.	SPRING for De. Compressor	1	1	1	1
49.	De.Comp. ADJUSTING SECREW	1	1	1	1
-	LOCK NUT for 49	1	1	1	1
50.	STUD for Rocker Box Cover	1	1	1	1
51.	JOINT for Rocker Box Cover	1	1	1	1
52.	ROCKER BOX COVER	1	1	1	1
53.	HAND NUT for 50	1	1	1	1

## Camshaft, Governor Lever and Fuel Pump

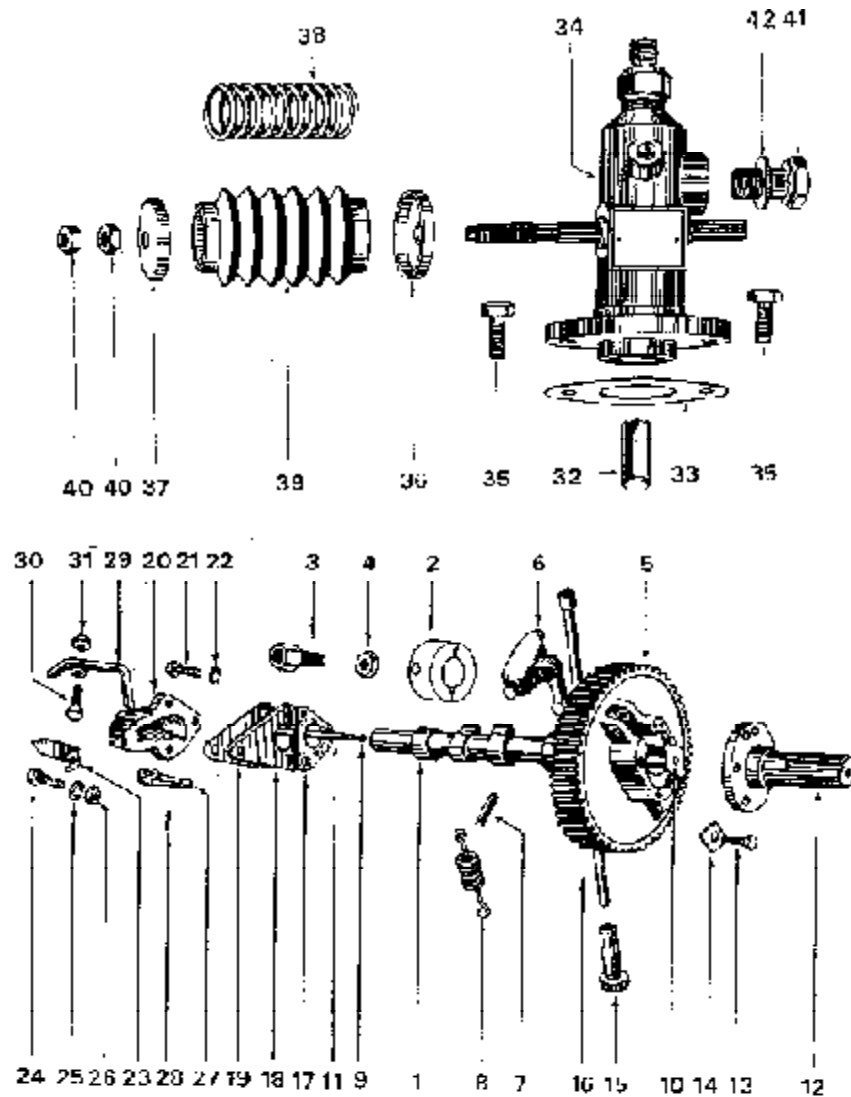
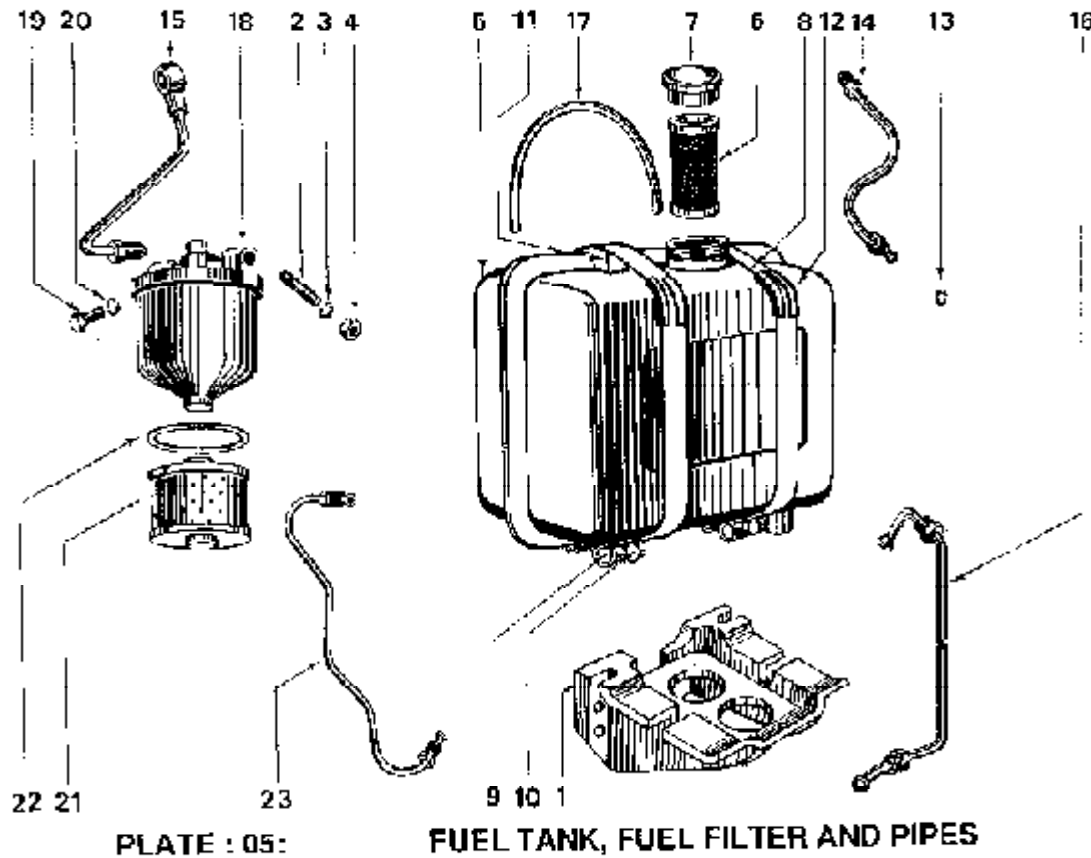


PLATE : 04: CAMSHAFT, GOVERNOR LEVER AND FUEL PUMP

Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	Cam Shaft	1	1	1	1
02.	Cam shaft BEARING (Pair)	1	1	1	1
03.	Lock Screw for C. S. Bearing	1	1	1	1
04.	Lock nut for 3	1	1	1	1
05.	Governor Gear	1	1	1	1
06.	Governor Weight	2	-	2	-
06.	Governor Weight	-	2	-	2
07.	Gov. Weight Spindle	2	2	2	2
-	Split pin for spindle	4	4	4	4
08.	Gov. Weight Spring	2	-	2	-
08.	Gov. Weight Spring	-	2	-	2
09.	Ball for Gov. Push Rod	1	1	1	1
10.	Gov. Push Rod with Push Plate	1	1	1	1
11.	Gov. Push Rod - Plain	1	1	1	1
12.	Cam shaft Extension Shaft	1	1	1	1
13.	Bolts fo C. S. Shaft	4	4	4	4
14.	Spring Washer	4	4	4	4
15.	Valve Tappets (In. & Exh)	2	2	2	2
16.	Valve Pushrod	2	2	2	2
17.	Joint for Adoptor Plate	1	1	1	1
18.	Adoptor Plate	1	1	1	1
19.	Joint for Fulcrum Bracket	1	1	1	1
20.	Fulcrum Bracket	1	1	1	1
21.	Bolt for Bracket	3	3	3	3
22.	Spring Washer	3	3	3	3
23.	Pointer for Timing	1	1	1	1
24.	Bolt for Pointer	1	1	1	1
25.	Spring Washer	1	1	1	1
26.	Nut for 24	1	1	1	1
27.	Gov. Inside Lever	1	1	1	1
28.	Pin for Gov. In Lever	1	1	1	1
29.	Gov. External Lever	1	1	1	1
30.	Gov. Adjusting Screw	1	1	1	1
31.	Lock nut for 30	1	1	1	1
32.	Fuel Pump Tappet	1	1	1	1
33.	Fuel Pump Joint (SHIMS)	As Required			
34.	Fuel Pump	1	1	1	1
35.	Bolt for Fuel Pump	2	2	2	2
36.	Spring Coller - Pump Side	1	1	1	1
37.	Spring Coller - Lever Side	1	1	1	1
38.	Speeder Spring	1	-	1	-
38.	Speeder Spring	-	1	-	1
39.	Dust Cover for S. Spring	1	1	1	1
40.	Rack Adjusting Nut & Locknut	2	2	2	2
41.	Benjo Bolt	1	1	1	1
42.	Joint (Wahser) for Banjo Bolt	2	2	2	2

## FUEL TANK, FUEL FILTER PIPES



Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	Fuel Tank BRACKET	1	1	1	1
02.	STUDS for F. TY. Bracket	3	3	3	3
03.	Spring Washer	3	3	3	3
04.	NUT for 2	3	3	3	3
05.	FUEL TANK	1	1	1	1
06.	STRAINER for Fuel Tank	1	1	1	1
07.	Fuel Tank CAP	1	1	1	1
08.	STRAPS for Fuel Tank	2	2	2	2
09.	PEG for Fuel Tank Strap	4	4	4	4
10.	BOLT for Straps	2	2	2	2
-	NUT for 10	2	2	2	2
11.	SUPPORTS for Straps	2	2	2	2
12.	Rubber Strips for Straps	4	4	4	4
13.	Washer for Fuel Pipe	1	1	1	1
14.	FUEL PIPE - Tank to Filter	1	1	1	1
15.	FUEL PIPE - Filter to Pump	1	1	1	1
16.	FUEL PIPE - Pump to Injector	1	1	1	1
17.	Fuel LEAK OFF PIPE	1	1	1	1
18.	FUEL FILTER (Complete)	1	1	1	1
19.	BOLT for Fuel Filter	2	2	2	2
20.	Spring Washer	2	2	2	2
21.	FILTER ELEMENT	1	1	1	1
22.	Sealing RING for Cover	1	1	1	1
23.	Lub. Oil Pipe (To Camshaft Bearing)	1	1	1	1

## AIR, EXHAUST AND WATER CONNECTIONS, STARTING HANDLE

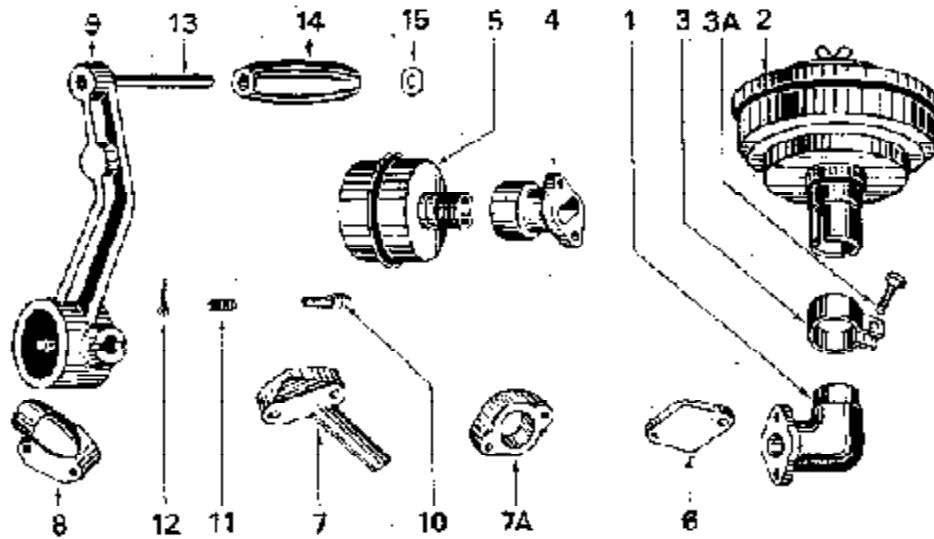
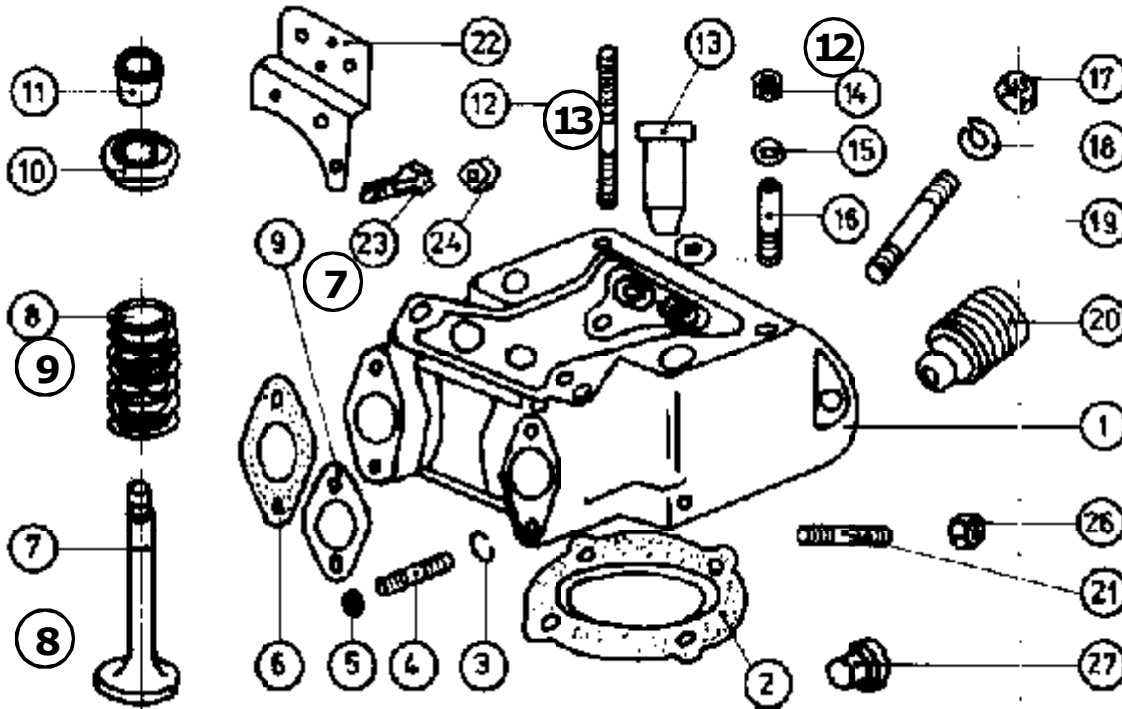


PLATE : 06: AIR, EXHAUST AND WATER CONNECTIONS, STARTING HANDLE

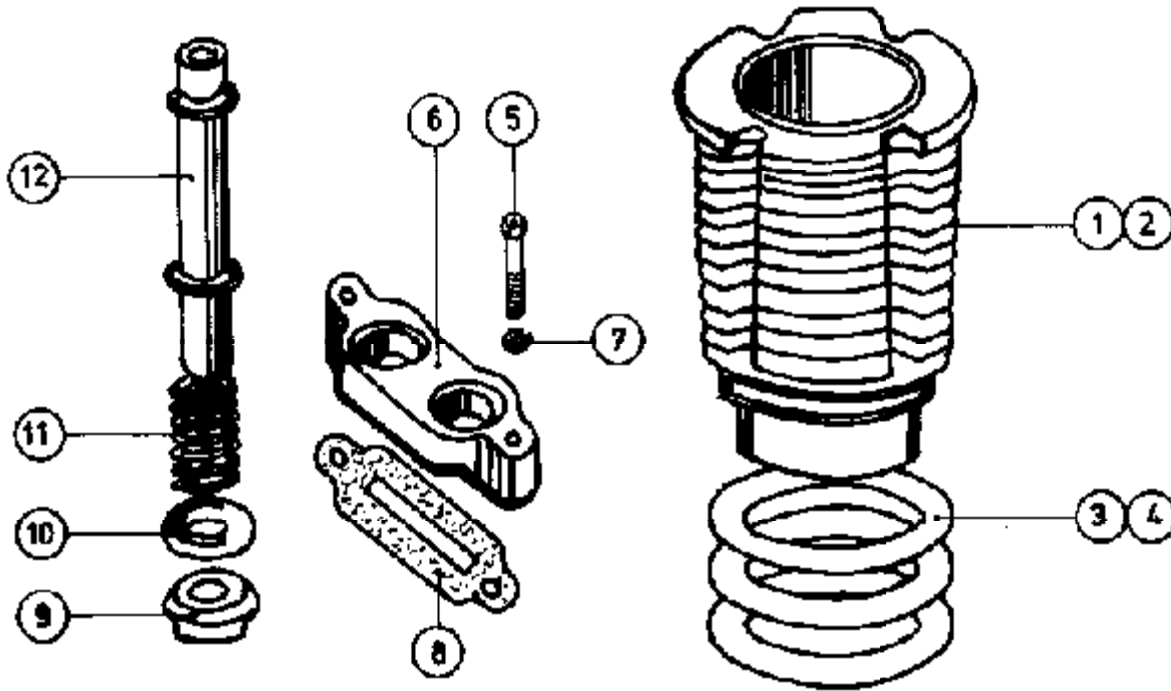
Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	AIR INLET BAND	1	1	1	1
02.	AIR CLEANER (Oil Bath)	1	1	1	1
03.	CLIP for Air cleancer	1	1	1	1
04.	EXHAUST FLANGE	1	1	1	1
05.	EXHAUST SILENCER	1	1	1	1
06.	WATER BLANKING PLATE	1	1	1	1
07.	WATER INLET GLANGE	1	1	1	1
08.	WATER OUTLET FLANGE	1	1	1	1
09.	STARTING HANDLE	1	1	1	1
10.	CLUTCH PIN	1	1	1	1
11.	SPRING for Clutch Pin	1	1	1	1
12.	SPILT PIN for Clutch Pin	1	1	1	1
13.	SIPNDLE for Grip	1	1	1	1
14.	Handle GRIP	1	1	1	1
15.	Washer for Spindle	1	1	1	1

## CYLINDER HEAD FOR AIR COOLED



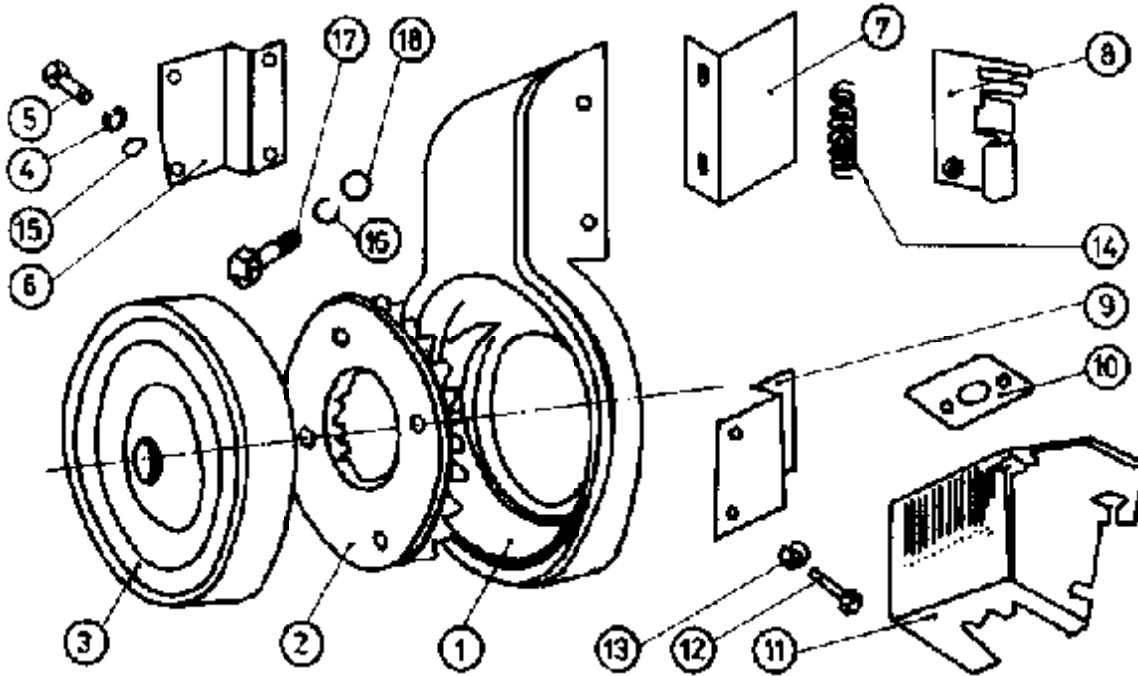
Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	CYLINDER HEAD	-	-	1	1
02.	CYLINDER HEAD GASKET			1	1
03.	Spring Washer			4	4
04.	STUD			4	4
05.	NUT			1	1
06.	EXHAUST BAND JOINT			1	1
07.	INLET BAND JOINT			2	2
08.	VALVE			2	2
09.	VALVE SPRING			2	2
10.	VALVE CUP			2	2
11.	VALVE COTTER			2	2
12.	VALVE GUIDE			2	2
13.	STUD FOR ROCKER BOX COVER			1	1
14.	NUT			4	4
15.	SPRING WASHER			4	4
16.	STUD FOR ROCKER BOX			4	4
17.	NUT			2	2
18.	SPRING WISER			2	2
19.	STUD FOR ATOMISER			2	2
20.	NOZZLE SLEEVE			1	1
21.	STUD			1	1
22.	TANK BRACKET			1	1
23.	BOLT			3	3
24.	NUT			3	3
25.	NUT			1	1

## CYLINDER BLOCK FOR AIR COOLED FAN COULING



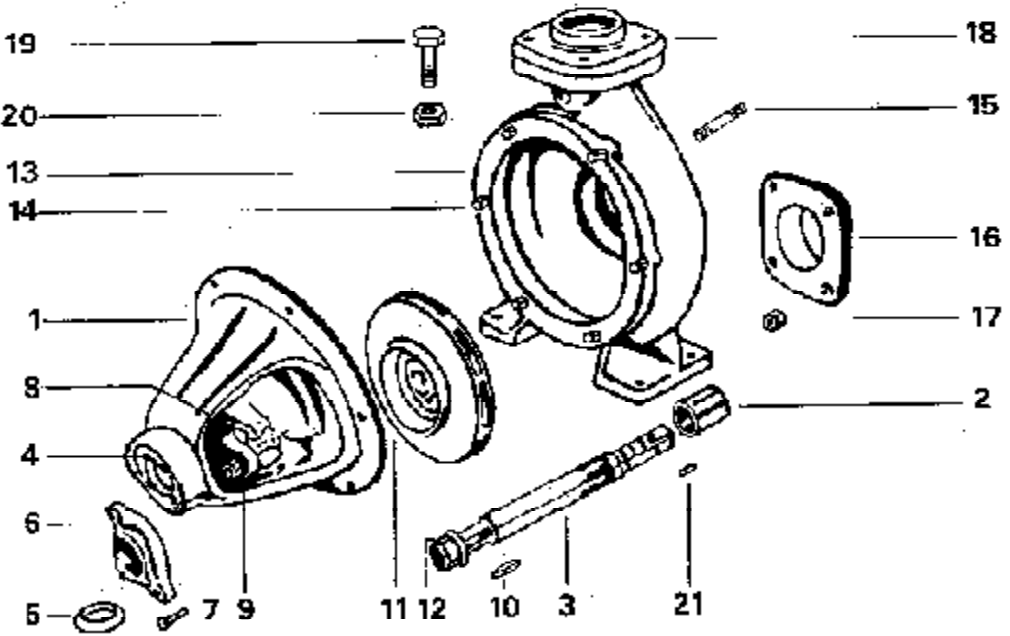
Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	CYLINDER BLOCK			1	
02.	CYLINDER BLOCK				1
03.	BLOCK SHIMS	As Required			
04.	BLOCK SHIMS	As Required			
05.	BOLT			2	2
06.	TAPPET BLOCK			1	1
07.	SPRING WASHER			2	2
08.	JOINTS FOR TAPPET BLOCK			1	1
09.	RUBBER BUSH			2	2
10.	WASHER			2	2
11.	SPRING FOR PUSH ROD TUBE			2	2
12.	PUSH ROD TUBE			2	2

## FANCOULING FOR AIR COOLED



Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	FAN COULING			1	1
02.	FAN			1	1
03.	FLYWHEEL			1	1
04.	SPRING WASHER			8	8
05.	BOLT			4	4
06.	CLAMP INSPECTION COVER SIDE			1	1
07.	BLOCK COVER LEFT			1	1
08.	BLOCK COVER RIGHT			1	1
09.	CLAMP FUEL PUMP SIDE			1	1
10.	NOZZLE COVER			1	1
11.	CYLINDER HEAD COULING			1	1
12.	BOLT			2	2
13.	SPRING WASHER			2	2
14.	SPRING WASHER			2	2
15.	PLAIN WASHER			2	2
16.	SPRING WASHER			4	4
17.	BOLT			4	4
18.	PLAIN WASHER			4	4

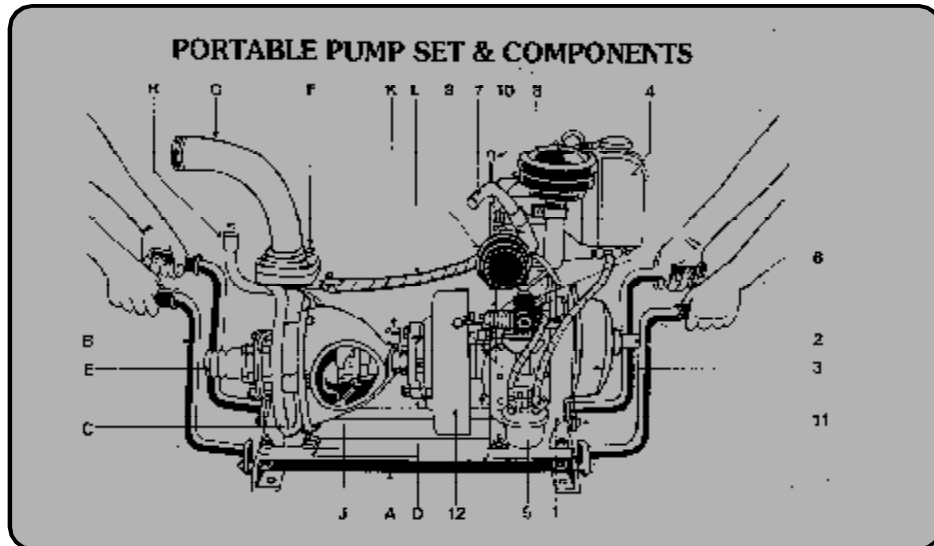
# PART'S VIEW OF CENTRIFUGAL PUMP



PARTS LIST: PART'S VIEW OF CENTRIFUGAL PUMP (APL-252)

Sr. No.	DESCRIPTION	NO. OFF			
		PVL 35/45	PVL 50/60	PAL 35/45	PAL 50/60
01.	CASING BODY	1	1	1	1
02.	BUSH for Shaft	1	1	1	1
03.	SHAFT	1	1	1	1
04.	BEARING	1	1	1	1
-	Bearing SPACER	1	1	1	1
05.	Water Deflector	1	1	1	1
06.	Bearing Cover	1	1	1	1
07.	BOLT for Bearings Cover	2	2	2	2
-	GLAND (Dori) Packing	4	4	4	4
-	Water Ring	1	1	1	1
08.	Gland Flange	1	1	1	1
09.	Bolt for Gland	2	2	2	2
09.	Bolt & Nut for Gland	2	2	2	2
10.	KEY for Impeller	1	1	1	1
11.	IMPELLER	1	1	1	1
12.	NUT for Impeller	1	1	1	1
13.	CASING	1	1	1	1
-	Joint for Casing	1	1	1	1
14.	BOLY Ts for casing	6	6	6	6
15.	STUD for Siction Flange	4	4	4	4
-	JOINT for Siction Flange	1	1	1	1
16.	SUCTION FLANCE	1	1	1	1
17.	NUT for Suction Flange	4	4	4	4
-	JOINT for Delivery Flange	1	1	1	1
18.	DELIVERT FLANGE	1	1	1	1
19.	BOLT for Delivery FLANGE	4	4	4	4
20.	BOLT for Delivery Flange	4	4	4	4
-	PLUG for Casing	1	1	1	1
-	GREASE CUP	1	1	1	1
-	COLLER for Coupling Flange	1	1	1	1
21	KEY for Coupling Flange	1	1	1	1
-	COUPLING FLANGE	1	1	1	1
-	Lock Bolt & Nut for Coupling Flange	1	1	1	1

## PORTABLE PUMP SET & COMPONENTS



### IDENTIFICATION :

- |                         |                                 |
|-------------------------|---------------------------------|
| 1. Engine Body          | A. Base Frame                   |
| 2. Extension Shaft      | B. Lifting Handle               |
| 3. Gear Cover           | C. Centrifugal Pump             |
| 4. Fuel Tank            | D. Pump Coupling Flange         |
| 5. Fuel Filter          | E. Suction House Connection     |
| 6. Fuel Pump            | F. Delivery Flange              |
| 7. Cooling Water Outlet | G. Delivery Bend                |
| 8. Air Filter (Cleaner) | H. Priming Bend                 |
| 9. Exhaust Silencer     | J. Gland Flange                 |
| 10. De-compressor lever | K. Grease Cup                   |
| 11. Drain Pipe & Plug   | L. Hous Pipe for Engine Cooling |
| 12. Flywheel            |                                 |



**GL TYPE Pump Gland (Rope)**



**DB Type Double Bering Seal - Pump**

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As Continuous improvements are contemplated the illustrations  
and descriptions are not binding.

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## *Hrishi Exports Pvt. Ltd.*

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